**Static Electricity Mini IA:**

**Introduction**  
Have you ever wondered why rubbing a balloon or a blanket—or even a winter hat—on your head makes your hair stand up? The effect is due to static electricity, but how is the static electricity made, and why does it make your hair stand on end?

Static electricity is the buildup of electrical charge in an object. Sometimes static electricity can suddenly discharge, such as when a bolt of lightning flashes through the sky. Other times, static electricity can cause objects to cling to one another. Think of how socks fresh out of the dryer stick together. This happens when objects have opposite charges, positive and negative, which attract. (Objects with the same charges repel one another.) Could enough static electricity make a balloon stick to a wall? How much do you think you would have to rub it? DOES THE VOLUME OF THE BALLOON INFLUENCE ITS CAPACITY TO STICK TO THE WALL?

**Background**

When one object is rubbed against another, static electricity can be created. This is because the rubbing creates a negative charge that is carried by electrons. The electrons can build up to produce static electricity. For example, when you shuffle your feet across a carpet, you are creating many surface contacts between your feet and the carpet, allowing electrons to transfer to you, thereby building up a static charge on your skin. When you touch another person or an object, you can suddenly discharge the static as an electrical shock.

Similarly, when you rub a balloon on your head it causes opposite static charges to build up both on your hair and the balloon. Consequently, when you pull the balloon slowly away from your head, you can see these two opposite static charges attracting one another and making your hair stand up.

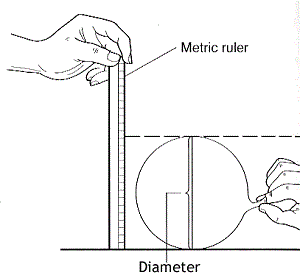
**Materials**  
•    Balloon  
•    An object made out of wool (such as a sweater, scarf, blanket or ball of yarn)  
•    Stopwatch  
•    A wall  
•    A partner (optional)

**Preparation**

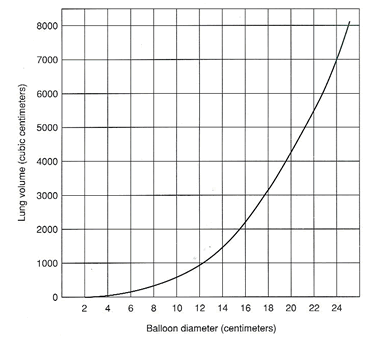
**1. Read through the procedure and make a table you will use to record your results**  
1. Blow up the balloon and tie off the end.

2. Measure the volume of your balloon and record it  
3. Have your partner prepare to use the stopwatch.  
  
**Procedure**  
•    Hold the balloon in a way that your hand covers as little of its surface area as possible, such as by using only your thumb and pointer finger or by gripping the balloon by its neck where it is tied off.  
•    Rub the balloon on the woolly object in one direction  
•    Hold the balloon up on the wall with the side that was rubbed against the wool facing the wall, then release it. Does the balloon stay stuck on the wall? If the balloon stays stuck, have your partner immediately start the stopwatch to time how long the balloon remains bound to the wall. If the balloon does not stick, move to the next step.  
•    Touch the balloon to a metal object. Why do you think this is important to do?  
•    Repeat the above process but each time increase the number of times you rub the balloon on the woolly object. Rub the balloon in the same direction each time. (Do not rub the balloon back and forth.) How many rubs does it take to make the balloon stick to the wall for a few seconds? What about multiple minutes?  
•    You can repeat this whole process two more times with balloons of differing volume. Do your observations for each trial match with the previous trials?  
  
**Observations and results**  
In general, did the balloon stick to the wall for a longer amount of time as you increased the balloon volume?

Wool is a conductive material, which means it readily gives away its electrons. Consequently, when you rub a balloon on wool, this causes the electrons to move from the wool to the balloon's surface. The rubbed part of the balloon now has a negative charge. Objects made of rubber, such as the balloon, are electrical insulators, meaning that they resist electric charges flowing through them. This is why only part of the balloon may have a negative charge (where the wool rubbed it) and the rest may remain neutral.

When the balloon has been rubbed enough times to gain a sufficient negative charge, it will be attracted to the wall. Although the wall should normally have a neutral charge, the charges within it can rearrange so that a positively charged area attracts the negatively charged balloon. Because the wall is also an electrical insulator, the charge is not immediately discharged. However, because metal is an electrical conductor, when you rub the balloon against metal the extra electrons in the balloon quickly leave the balloon and move into the metal so the balloon is no longer attracted and does not adhere.

2. Measuring Vital Capacity -- Stretch a round balloon several times to stretch it out. Take a deep breath and then exhale into the balloon. Pinch the end of the balloon and measure its diameter in cm. Record on data table.



3. Convert the diameter to volume using the graph and record this on your table

Assessment:

You will be writing a short report (one page max) of your findings and must include:

1. An introduction to static electricity

2. Your research question (RQ)

3. Your methods/procedure

4. Your results including a graph

5. A conclusion

6. An evaluation section that lists some things you would consider next time to increase the reliability of your results